Weak Lensing with SNAP

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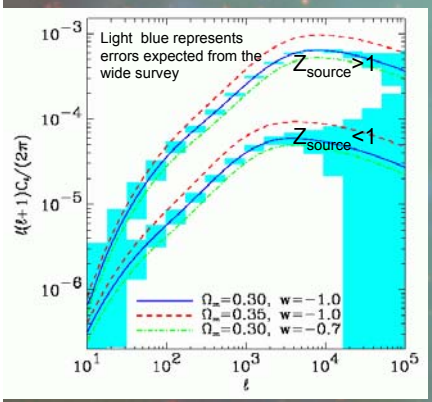
Weak gravitational lensing is a small distortion in background galaxy shapes and sizes caused by foreground dark matter. Weak lensing can provide tight constraints on the amount (Ω_M) and clustering (σ_8) of dark matter. Tomographic techniques allow for the study of the evolution of structure which is determined by the dark energy equation of state parameter (w) and its time evolution (w_a). Space offers significantly higher resolution and better photometric accuracy than the ground, allowing for better shape measurements, higher photo-z accuracy, and measurements of a significant fraction of galaxy shapes at z>1.

SNAP Surveys:

	15 sq degree Deep SN Survey	300-1000 sq degree Weak Lensing Survey	5000-10000 sq degree Panoramic Survey
	• 9 optical and NIR bands	•9 optical and NIR bands	•9 optical and NIR bands
	•AB=30.0	•AB=27.5	•Possible 2-4 year survey
	•N_{gal}=200 arcmin^{-2}	•N_{gal}≈100 arcmin^{-2}	•N_{gal}≈40-80 arcmin^{-2}
	•10 million galaxies	•100-200 million galaxies	•Up to one billion galaxies

Techniques:

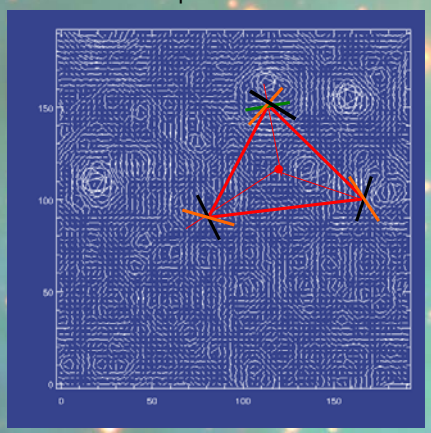
Measurement of the mass power spectrum in 2 redshift bins



Rhodes et al, 2004 Astroparticle Physics in press;
Massey et al astro-ph/0304418
Refregier et al astro-ph/0304419

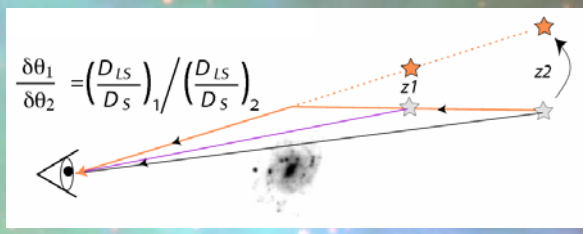
Measurement of bispectrum and higher order correlation functions

3-point correlation function



Takada and Jain astro-ph/0310125

Cross Correlation Cosmography

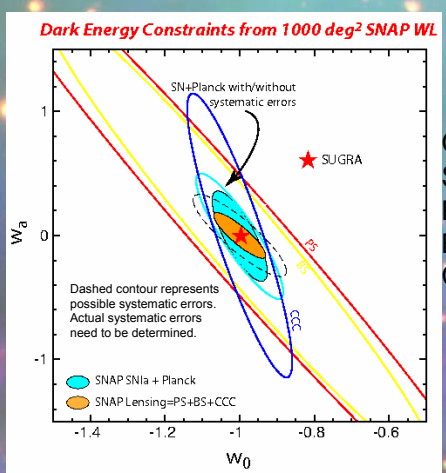


Jain and Taylor, 2003, PRL, 91, 141302;
Bernstein and Jain, 2004, ApJ in press

- Identify foreground structures, cross-correlate with background slices at various redshifts
- Uncorrected PSF shapes average to zero when cross-correlated with foreground
- Non-linear power spectrum irrelevant so information from all scales is useful
- Systematic errors still under invesitgation

See also Song and Knox astro-ph/0312175;
Zhang, Hui, & Stebbins astro-ph/0312348

Cosmological constraints:



Central star is ΛCDM
SUGRA=supergravity
PS= Power Spectrum
BS=Bispectrum
CCC=Cross Correlation Cosmography

SNAP

http://snap.lbl.gov

Photo courtesy NOAO, taken with LBNL "hot red" CCD